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CROSS-BLOCKING
SUGAR BEETS
BY MACHINE

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CROSS BLOCKING SUGAR BEETS BY MACHINE

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This leaflet describes the machine set-ups by which sugar beets may be satisfactorily blocked by machine. Approximately 90 man-hours of labor are required to produce an acre of sugar beets. Of this total, 55 man-hours are entirely hand labor. A survey of a number of farms in Weld County, Colo., during 1922–27 showed that the labor cost in growing sugar beets averaged $35.08 per acre. The major hand operations consist of blocking and thinning the young plants during the early growing season and pulling and topping the mature beets at harvest time.

Field studies [1] of cross blocking by various methods were made in Michigan, Minnesota, Colorado, Utah, Idaho, and California under a wide variety of soil and plant-growth conditions and with several types of blocking machines. The general outcome of these tests showed definitely that mechanical blocking may be substituted for hand blocking with the hoe, provided initial stands are adequate and the work is carefully done so as to prevent injury to the stand.

A beet-blocking machine, to be thoroughly satisfactory, should meet the following requirements:

(1) The first cost should be small and the implement easily adapted to specific conditions.

(2) The cost of blocking by machine should be less than with hand methods.

(3) The work should be done as well as that done by hand or better.

(4) The tilth of the soil should be improved so as to make subsequent thinning operations easier.

(5) It should be possible to operate the equipment so that effective weed control and a clean job of cross blocking are accomplished.

Manner of Conducting the Tests

Fields were divided into plots, and alternate plots were machine blocked and hand blocked. Most of the machine blocking was done with knife weeders or duck-feet, so spaced that the remaining blocks were 12 inches apart from center to center. This setting gives 100 beets per 100 feet of row, if there is a full stand of beets. Records of the initial stands of beets, the number of blocks containing beets, the number of blank blocks, and the final stand of beets after thinning were made. Records of the labor requirements with both methods and of the yields at harvest were also kept. Comparative tests were made with different machine settings to determine the possibility of leaving more nearly 100 beets per 100 feet of row when the initial stand of beets is not good.

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[1] The work was carried on in cooperation with the Colorado Agricultural Experiment Station, the University of California, and with sugar companies in the various States where field studies were made.

Machines for Cross Blocking or Cross Cultivating Sugar Beets

In its simplest form a cross-blocking machine is an ordinary beet cultivator with cultivator tools so spaced that blocks of plants of the desired size and spacing are left undisturbed when the cultivator is drawn crosswise of the beet rows. A marker, similar to that used on a beet drill or corn planter, is necessary. Two markers, one attached to each side of the machine, are preferable to one marker. The blocker is approximately 8 feet wide, so if a single marker is attached to the center of the machine it must have an arm 8 feet long, which makes it awkward to handle.

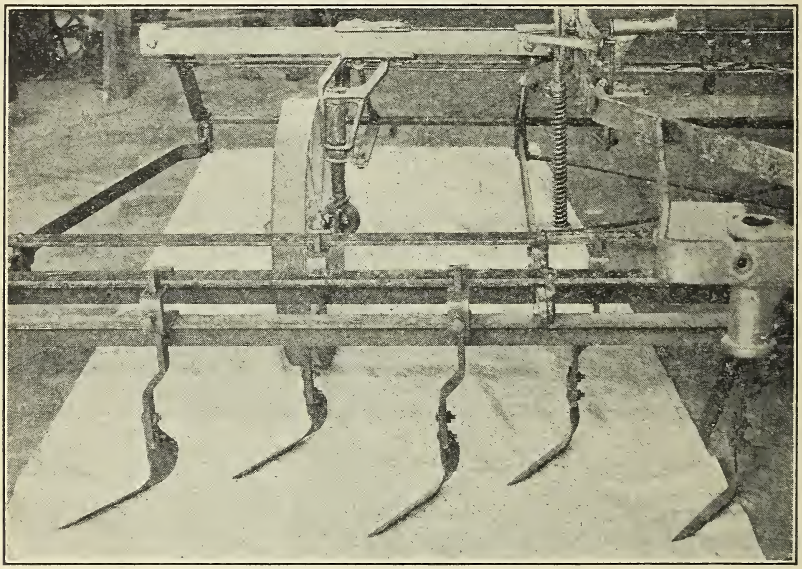

FIGURE 1.—One arrangement of knives on cultivator for cross blocking.

It is desirable to have an even number of cultivating tools on each side of the center of the machine so that the marker will leave its mark between blocks rather than in a block of beets.

Where no unusual conditions exist, knife weeders (knives) may be used for blocking. These should be so spaced on the tool bar that they will leave blocks of the desired size. Nine knives of equal length arranged with 1 in the center and 4 on each side will leave 8 blocks within the width of the machine. If the end knives are full length a ninth block will be formed on each round trip across the field.

When the original stand of beets is not good the tools may be spaced so that larger blocks of beets are left and the rows of blocks are closer together. a fuller stand of beets after thinning being thereby assured.

The set-up shown in figure 1 may be obtained with very little equipment additional to that required for beet cultivation. Any desired spacing may be had except that the width of cut of the knives limits the amount of cut between the blocks. The knives should be as nearly flat as possible so that soil will not be torn from the beet blocks.

A greater range of adjustment may be had by allowing the knives to overlap, as shown in figure 2. The knives shown are adjustable to any angle. The shield, which is integral with the knife, protects the block from being covered by the soil. It is desirable to have the knives shown in both figure 1 and figure 2 staggered as shown, to make them self-cleaning and to throw soil toward the blocks rather than away from them.

In extremely loose or trashy soil, where knives have a tendency to push the soil and to tear small plants from their blocks, it is desirable to use disks, as shown in figure 3. Disks, by their rolling and cutting action, leave the block of beets unharmed. The desired cultivation between blocks is accomplished by additional disks or by the use of knives, as shown. These also throw soil against the shoulders formed by the disks and prevent drying out of the exposed plants.

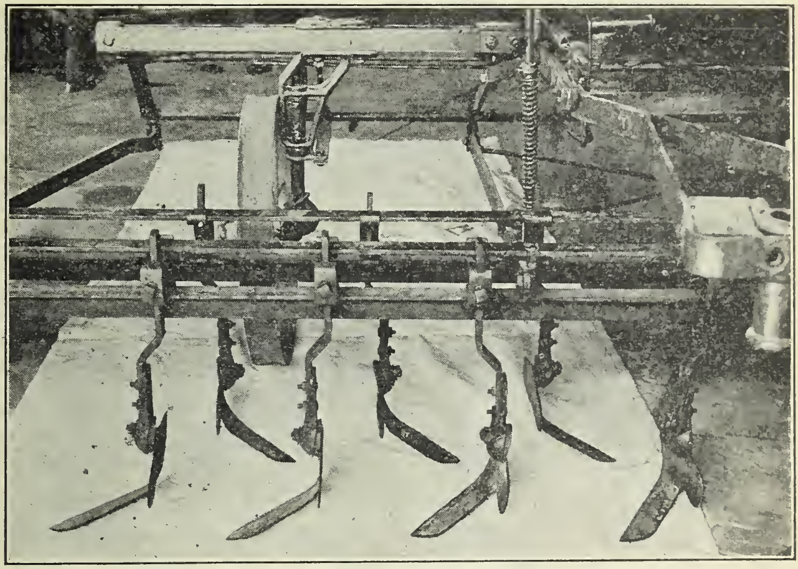

FIGURE 2.—Cultivator with adjustable, overlapping knives.

If the soil is in good tilth and free from trash, duck-feet in a set-up such as shown in figure 4 will do good work. The blades of the duck-feet should be flat, and hence lessen the danger of covering the beets in the blocks. Any one of several sizes of duck-feet may be used, depending on the type of soil to be cultivated. When it is desired to do cross cultivating after blocking, the duck-feet may be spaced so that the blocks will be wide enough apart to permit the team or tractor to travel between cross rows without difficulty.

A Method of Improving the Stand of Cross-Blocked Beets

The experiments showed that appreciably better stands of beets can be had by adjusting the equipment to meet actual conditions of the field. A careful study of the stand of seedlings and the use of figure 5 will enable the operator to determine the best arrangement of knives on the cultivator to obtain the desired stand of beets after blocking.

To illustrate the use of figure 5, suppose there are 50 inches per 100 inches of row in which there are beets. Find the line marked 50 at the bottom of the chart and follow it to its intersection with the curve marked 4—8. At the left of the chart opposite this point it will be noted that the final stand of beets after thinning will be 85 beets per 100 feet of row. This means that with the knives set so as to leave a 4-inch block and cut out 8 inches, beets would be left in 85 percent of the blocks. With the same stand of beets before thinning a 4—7 combination would produce a stand of 93 percent. The final stand of beets as indicated on the left of the chart takes into consideration not only the probability of the mechanical blocker cutting out an occasional block of beets but also allows for beets lost in the thinning operation.

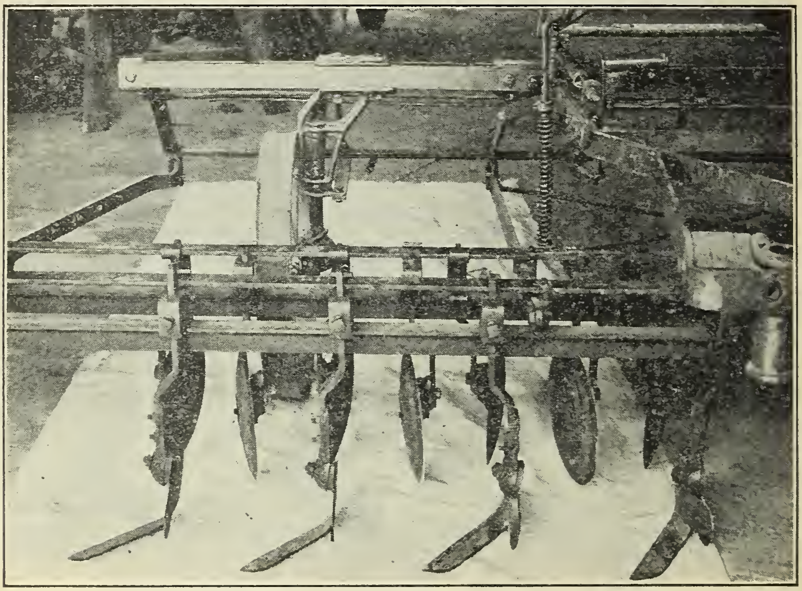

Figure 3.—Disk-and-knife arrangement for cross blocking.

Advantages of Mechanical Cross Blocking

Since mechanical blocking is less injurious to the beet seedlings than is hand blocking, the blocking can be done as soon as the stand of seedlings indicates what space adjustments are necessary to give the desired spacing in the row. Early blocking decreases crowding by removing surplus beets and weeds, and this, in turn, reduces the demands on the soil for moisture and plant food.

The spacing of mechanically cross-blocked beets is more uniform than that obtained by hand blocking, and, under careful supervision, should correct the tendency to make spacings between the beets too wide. Also the worker has more opportunity to do selective thinning.

Mechanical cross blocking makes cross cultivation possible. Beets which are properly cross cultivated seldom need much hand hoeing. Sugar-beet growers in Minnesota in 1931 who practiced cross cultivation saved approximately $4 to $6 an acre in the contract hand-labor cost. Cracks are less likely to form in the row of cross cultivated beets, and hence there is less likelihood of the soil drying out.

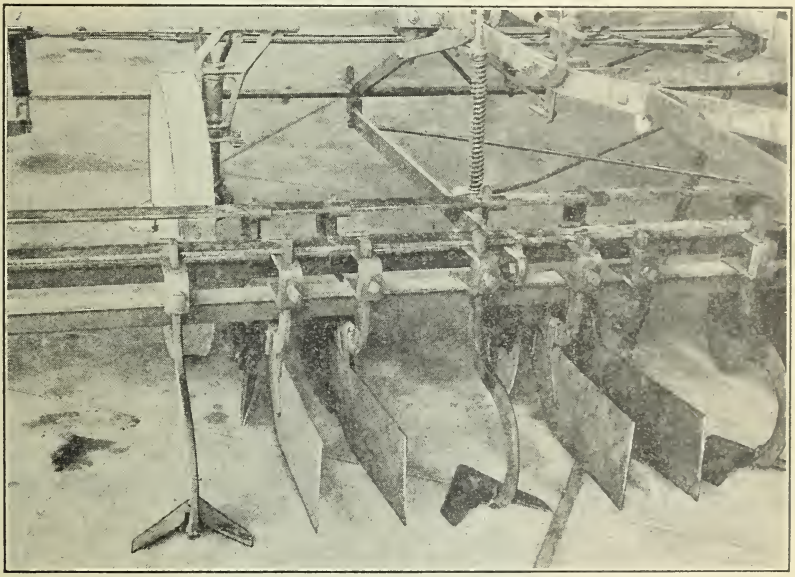

FIGURE 4.—Cultivator equipped with duck-feet, disks, and shields, spaced for subsequent cross cultivation.

Cross-cultivated beets are more uniform in size and hence are easier to top.

Because of the more effective weed control obtained through mechanical cross blocking of beets, the subsequent thinning operation is more rapidly accomplished in cross-blocked beets than in hand-blocked beets. This should enable the grower to plant his entire acreage at one time instead of at two or three successive plantings as is sometimes required. Aside from the possible saving in cost when all the planting is done at one time, the early planted beets are likely to yield better than the later plantings.

In one experiment there was a saving in man labor of 38 percent in thinning mechanically cross-blocked beets as compared with thinning hand-blocked beets. When cross cultivation was practiced the saving of labor in thinning was even greater.

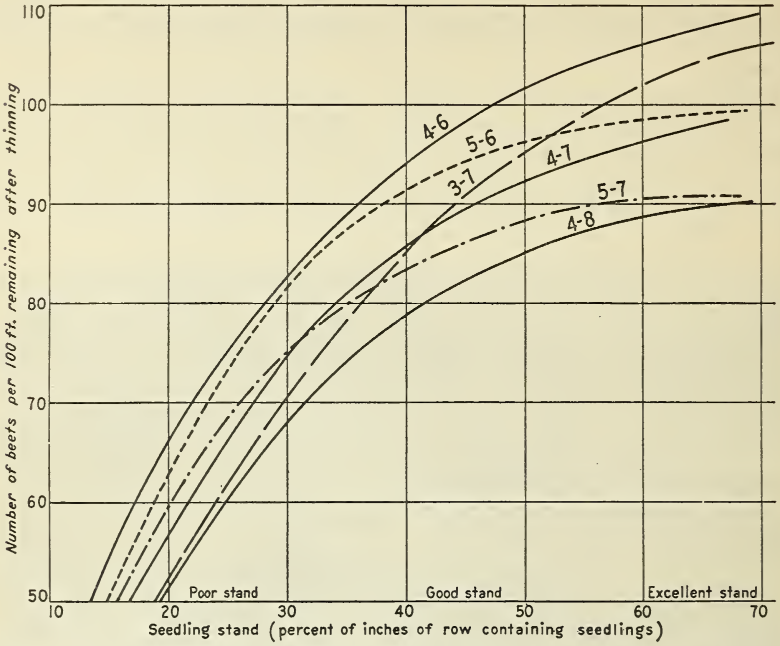

FIGURE 5.—Chart for determining proper spacing of cultivator tools for cross blocking sugar beets when the stand of seedlings is known.

While there are usually fewer beets in mechanically cross blocked than in hand-blocked rows, they are generally larger because each has more space in which to develop.

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